Figure 1:

Amino acid sequences of Cpn60 and Cpn10:

SEQ ID No 1: Cpn10 (encoded by nucleotides pos. 458-751 of Figure 2):

MKIRPLHDRIVVRRKEEETATAGGIILPGAAAEKPNQGVVISVGTGRILDNGSVQALA
VNEGDVVVFGKYSGQNTIDIDGEELLILNESDIYGVLEA

SEQ ID No 2: Cpn60 (encoded by nucleotides pos. 800-2446 of Figure 2):

MAAKDVLFGDSARAKMLVGVNILADAVRVTLGPKGRNVVIEKSFGAPIITKDGVSVA
REIELKDKFENMGAQMVKEVASQANDQAGDGTTTATVLAQAIISEGLKSVAAGMNP
MDLKRGIDKATAAVVAAIKEQAQPCLDTKAIAQVGTISANADETVGRLIAEAMEKVG
KEGVITVEEGKGLEDELDVVEGMQFDRGYLSPYFINNQEKMTVEMENPLILLVDKKI
DNLQELLPILENVAKSGRPLLIVAEDVEGQALATLVVNNLRGTFKVAAVKAPGFGDR
RKAMLQDLAILTGGQVISEELGMSLETADPSSLGTASKVVIDKENTVIVDGAGTEASV
NTRVDQIRAEIESSTSDYDIEKLQERVAKLAGGVAVIKVGAGSEMEMKEKKDRVDDA
LHATRAAVEEGVVAGGGVALIRALSSVTVVGDNEDQNVGIALALRAMEAPIRQIAGN
AGAEGSVVVDKVKSGTGSFGFNASTGEYGDMIAMGILDPAKVTRSSLQAAASIAGL
MITTEAMVADAPVEEGAGGMPDMGGMGGMGGMPGMM

Figure 2:

SEQ ID No 3: DNA coding for Cpn60 and Cpn10:

Cpn10, pos. 458-751
Cpn60, pos. 800-2446

atcaaaaaatgcagcaaggacagattcctgcccaagaattagcagaaggtttcttgttagcactggccggcgctttattattaacgccgg
gttttgtcactgatgcgctgggttttacattactcgtccccgcgacgcgtaaagcgttggtccataaggtgattgcatttattacccctc
gcatgatgactgcaagcagctttcaagcgacgggtagttttcaggaaggctcgtttaaagatgtacattcgcacactgactcgcaaagca
gtcatgaaaaaatcacaattgaaggcgaatataccaaagacgataagtaggtattttttcggctagccgttgaaatcctagtaaaagccc

cgataaattaaccatctatttttcacagaggcaatttagcctttgtttaccttattgatcctaatacttgggatccaacagttggagagtctagc

aaatgaaaatccgtccattacatgatcgtattgttgttcgccgtaaagaagaagagaccgcaactgcgggtggtattattttacc

gggcgctgcggcagaaaaaccaaatcaaggtgttgttatctctgtgggtactggccgtattcttgataatggttcagtgcaagcgctggc

ggttaacgaaggcgatgttgtcgttttggtaaatactcaggtcaaaatactatcgatatcgatggtgaagaattattgattttgaatga

aagtgatatctacggcgttttagaagcttaattattacactcacttttttatttaacctacaaaatttaaggaaagatcatggctgctaaagacg

tattatttggtgatagcgcacgcgcaaaaatgttggtaggtgtaaacattttagccgacgcagtaagagttaccttaggacctaa

aggtcgtaacgttgttatagaaaaatcatttggtgcaccgatcatcaccaaagatggtgtttctgttgcgcgtgaaatcgaattgaaagaca

aattcgaaaacatgggcgcacagatggttaaggaagttgcttctcaagccaacgaccaagccggtgacggcacaacgacagcgactg

tactagcacaggcgattatcagcgaaggcttgaaatctgttgcggctggcatgaatccaatggatcttaaacgtggtattgataaagctac

ggctgctgttgttgccgccattaaagaacaagctcagccttgcttggatacaaaagcaatcgctcaggtagggacaatctctgccaatgc

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gaccgtgttgacgatgcacttcatgcaactcgcgcagcggttgaagaaggtgttgttgcgggtggtggtgttgctttgattcgcgcactct

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atggcgatatgattgcgatgggtattttagaccctgcaaaagtcacgcgttcatctctacaagccgcggcgtctatcgcaggtttgatgat

cacaaccgaagccatggttgcggatgcgcctgttgaagaaggcgctggtggtatgcctgatatgggcggcatgggtggaatgggcgg

tatgcctggcatgatgtaatcactttgtgattcattgtcctgatctgcttaccgtgtaaaaagatcaggctcaaggctgtctctataaaaagcc

gtatctttgatgagtgttgtctttctgctgaaaacgacattcttggagtgcggcttttttttgattttggtcataaaattcagaatattgtgtaatttta

tgtaactagctggcctataatgttgagttcctctgggtggcatgatctcatggtacttcacttaagcctgattcactgcg

gctttaacagtaaaataataacgcaacgtagaaacataataagcgtatggcattaatgaagacggctgcatttaattcagatc

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Figure 3:

SEQ ID No 4: Amino acid sequence of esterase cloned from *Oleispira antarctica* (EstRB8):

EstRB8 (encoded by nucleotides 1145 to 2143 Frame 2 of Figure 4) 333 aa

MKNTLKSSSRFSLKQLGTGALIISSLFFGGCTTTQQDNLYTGVMSLARDSAGLEVKTA
SAGDVNLTYMERQGSDKDNAESVILLHGFSADKDNWILFTKEFDEKYHVIAVDLAG
HGDSEQLLTTDYGLIKQAERLDIFLSGLGVNSFHIAGNSMGGAISAIYSLSHPEKVKSL
TLIDAAGVDGDTESEYYKVLAEGKNPLIATDEASFEYRMGFTMTQPPFLPWPLRPSLL
RKTLARAEINNKIFSDMLKTKERLGMTNFQQKIEVKMAQHPLPTLIMWGKEDRVLD
VSAAAAFKKIIPQATVHIFPEVGHLPMVEIPSESAKVYEEFLSSIK

Figure 4:

SEQ ID No 5: DNA fragment from plasmid pBK1Est coding for esterase of *Oleispira antarctica* (EstRB8):

Nucleotide positions 1-100 correspond to reverse complement of positions 1196-1121 and 3799-3939 correspond to reverse complement of 1043-952 of pBK-CMV vector (Stratagene).

Positions 101-105 are *BamH*I – *Sau*3A1 fusion and positions 3795-3798 are *Sau*3A1-*Bam*HI-fusion.

acaggaaacagctatgaccttgattacgccaagctcgaaattaaccctcactaaagggaacaaaagctggagctcgcgcgcctgcag

gtcgacactagtggatcaacggcgttcatggtactggctgagttcagcgtcataatgccgatgcgatactggccgtcatgactgagtact

tcttctgctagcaccgattttctaatagcgcagcttcttttatttctgaacgggcaactgatgtagttttttttactaaccggcttttttaggcatgg

taaactcttcgatattcaaaattattactgttcatattacaatcatagtacaggctagaggcccaaaattgcagctgatattcacctttattattc

taagcattattacactcatcgcggtgttattaattgtgctaaataaaaatacccgtagcggaaaaattcagcaaatagccaaagaaaacga

ttggcaataccaagaattcatcgattttgatgatgacattaagcaggcaaactttggcctattaaactacagtcaaaatgcaatttttagacat

ctcattcaagcaactgacgaacactatggcttagcgtttaagacctttgactgtcgagcgttagaaccttcaggtattcacaatagcagtctt

attttatttaccctcgcactaaagactgaattcaataacctacacatttgcttaagtcgacatattcaagataaagatgccttcactgacatca

gtcaccaacaatcaatcaaacaccaataccaatcgcaaaaactcataaaactagccgatcaccaaatcccaaaagcgttcaaaatgaa

acgagcacgtcacacaaatcaatttatacgctaacgaaccaggtcaaacttatcgtttttttgagcacgtttgttccactaatgaaagaga

aaagtcgttaattcactggcttttggcgtatccgcaccttcacatagaaattagtaatggcatgctactggcctttaaaaagaatcagttaatt

gaagaaacctcgcttatctcagccattaccgctgtagccgaatttgcgcttatcctcagccatgattaaactgacgccaattaatataagac

atactaattaataactcccttaattgagaagaataatgaaaaacacactcaaatcctcatcacgtttagtctgaaacaactcggcaccggc

gctctgattatctccagtttgttcttcggtggttgcaccacaacacaacaagataatttatacacaggggttatgtctcttgcgagagacagc

gctggcctagaagttaaaacagcctctgccggtgacgtcaatcttacttatatggaacgccaaggcagtgacaaagataatgccgaaag

cgttattttattacacggtttctctgctgataaagataactggattcttttaccaaagaattcgatgaaaaatatcatgttatcgctgtcgattta

gcgggacatggcgattcagaacaattattaacgactgattacggtctcataaaacaagccgagcgtttagatatcttcttatctggcttagg

ggttaactcatttcacatcgccggtaattcaatgggggggggctatcagcgcaatctacagtttgagtcacccagagaaagttaaaagtctt

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gatgaagcaagttttgaataccgcatgggtttcaccatgactcagcctcctttcctaccttggccactaagaccttctttattacgtaaaacg

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aagtgaaaatggctcaacatccattgccaacactgattatgtggggcaaagaagatcgcgttcttgacgtatccgcagcagcggccttc

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gaagagttttgtcctctattaaataagagcacataatcatgactgacttataaacagccaagcatttaaaatgcttggctgtttattttaatgg

ccaaattattcaacgaccaagctctgcggtaaaatcgcagtgggtttcttgttttcatcaacagcaacaaacgtgaaataccccgtaatcg

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gtgataatatttcatcttgccatgagagcttatcatgaaagcctgtgcttaaaatcaatcattatatttattcatctttaattgaaataataccaat

atatttcatatataatttcacactacccttatctcactagacttcccgcgcataggcgcaaacaatcaacgcaagttcacaataaagcggttc

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cgatgacatagatctaatcgattatcaaacccgcattcaagcgctcattaaaaacgcaccactggcaagaagttctacctgcactgacca

atatgcaagcggcggcggaagagctgcctttgatcgatcaagaagaagggagcagcaaagaggaaaacaatcaaaaagaggagag

caatcaaataaaaacgagttattgaggattttaattttaaaacaggtatattaataccctctctcgtagtaaacaatgactgtatttacacaaaa

ataaatagaggtataccatgtcaaacatctggtttgaagtaccaaagattgaagtattaaaccgtcaaatggaaaatactgcctgcagcaa

cttaggcattcaaattacagaaattggcgatgattatatcactggcacaatgccagcagatgcacgtaccttccagccaatgggactgatt

catggcggctcaaatgtattgctggcagaaacactgggcagcatggcagctaactgctgtattaatttgtctcaagaatattgtgttggcc

aagaaattaacgccaaccacatacgcggtgttcgttccggcatagtgactggcacagcaacgctagtacacaaaggaagaacctccca

gatttgggaaattcgcatcgttaacgatccaaagaattcaaaaagcttctcgagagtacttctagagcggccgcgggcccatcgattttcc

acccgggtggggtaccaggtaagtgtacccaattcgccctatagtgagtcgtattacaattcactggccgtcgttttac

Figure 5:

Amino acid sequences expressed from vector pBK1CpnEst: - the co-expression of fragments
encoding native chaperonines with the esterase gene (EstRB8), all from *Oleispira antarctica*

SEQ ID No 6: cpn10 (nucleotides 113 to 403: Frame 2 of Figure 6) 97 aa:

MKIRPLHDRIVVRRKEEETATAGGIILPGAAAEKPNQGVVISVGTGRILDNGSVQALA
VNEGDVVVFGKYSGQNTIDIDGEELLILNESDIYGVLEA

SEQ ID No 7: cpn60 (nucleotides 455 to 2098: Frame 2 of Figure 6) 548 aa:

MAAKDVLFGDSARAKMLVGVNILADAVRVTLGPKGRNVVIEKSFGAPIITKDGVSVA
REIELKDKFENMGAQMVKEVASQANDQAGDGTTTATVLAQAIISEGLKSVAAGMNP
MDLKRGIDKATAAVVAAIKEQAQPCLDTKAIAQVGTISANADETVGRLIAEAMEKVG
KEGVITVEEGKGLEDELDVVEGMQFDRGYLSPYFINNQEKMTVEMENPLILLVDKKI
DNLQELLPILENVAKSGRPLLIVAEDVEGQALATLVVNNLRGTFKVAAVKAPGFGDR
RKAMLQDLAILTGGQVISEELGMSLETADPSSLGTASKVVIDKENTVIVDGAGTEASV
NTRVDQIRAEIESSTSDYDIEKLQERVAKLAGGVAVIKVGAGSEMEMKEKKDRVDDA
LHATRAAVEEGVVAGGGVALIRALSSVTVVGDNEDQNVGIALALRAMEAPIRQIAGN
AGAEGSVVVDKVKSGTGSFGFNASTGEYGDMIAMGILDPAKVTRSSLQAAASIAGL
MITTEAMVADAPVEEGAGGMPDMGGMGGMGGMPGMM

SEQ ID No 8: estRB8 (nucleotides 2579 to 3577: Frame 2 of Figure 6) 333 aa:

MKNTLKSSSRFSLKQLGTGALIISSLFFGGCTTTQQDNLYTGVMSLARDSAGLEVKTA
SAGDVNLTYMERQGSDKDNAESVILLHGFSADKDNWILFTKEFDEKYHVIAVDLAG
HGDSEQLLTTDYGLIKQAERLDIFLSGLGVNSFHIAGNSMGGAISAIYSLSHPEKVKSL
TLIDAAGVDGDTESEYYKVLAEGKNPLIATDEASFEYRMGFTMTQPPFLPWPLRPSLL
RKTLARAEINNKIFSDMLKTKERLGMTNFQQKIEVKMAQHPLPTLIMWGKEDRVLD
VSAAAAFKKIIPQATVHIFPEVGHLPMVEIPSESAKVYEEFLSSIK

Figure 6:

SEQ ID No 9: pBK1CpnEst: - the fusion of native chaperonine-coding fragments with esterase of *Oleispira antarctica* (EstRB8)

The DNA fragment coding for Cpn10 and Cpn60 is flanked by *Sac*I site (pos. 69-75) and *Sal*I site (encoded by pos. 2138-2143 of Figure 7):

Nucleotide positions 1-75 correspond to reverse complement of positions 1196-1121 and positions 5233-5273 correspond to reverse complement of 1043-952 of pBK-CMV vector (Stratagene)

Small letters – the Cpn10-Cpn60 encoding fragment,
Capital italics – fragments of vector pBK-CMV
Capital letters – fragment coding for EstRB8 from plasmid pBK1Est

ACAGGAAACAGCTATGACCTTGATTACGCCAAGCTCGAAATTAACCCTCACTAAAGGGA
*ACAAAAGCTGGAGCTC*ctaatacttgggatccaacagttggagagtctagcaaatgaaaatccgtccattacatgatcgtatt
gttgttcgccgtaaagaagaagagaccgcaactgcgggtggtattattttaccgggcgctgcggcagaaaaaccaaatcaaggtgttgt
tatctctgtgggtactggccgtattcttgataatggttcagtgcaagcgctggcggttaacgaaggcgatgttgtcgtttttggtaaatactc
aggtcaaaatactatcgatatcgatggtgaagaattattgattttgaatgaaagtgatatctacggcgtttttagaagcttaattattacactca
cttttttatttaacctacaaaatttaaggaaagatcatggctgctaaagacgtattatttggtgatagcgcacgcgcaaaaatgttggtaggt
gtaaacattttagccgacgcagtaagagttaccttaggacctaaaggtcgtaacgttgttatagaaaaatcatttggtgcaccgatcatcac
caaagatggtgtttctgttgcgcgtgaaatcgaattgaaaagacaaattcgaaaacatgggcgcacagatggttaaggaagttgcttctca
agccaacgaccaagccggtgacggcacaacgacagcgactgtactagcacaggcgattatcagcgaaggcttgaaatctgttgcgg
ctggcatgaatccaatggatcttaaacgtggtattgataaagctacggctgctgttgttgccgccattaaagaacaagctcagccttgcttg
gatacaaaagcaatcgctcaggtagggacaatctctgccaatgccgatgaaacggttggtcgtttaattgctgaagcgatggaaaaagt
cggtaaagaaggtgtgattaccgttgaagaaggcaaaggccttgaagacgagcttgatgttgtagaaggcatgcagttcgatcgcggtt
acttgtctccgtacttcatcaacaaccaagaaaaaatgaccgtagaaatggaaaatccattaattctattggttgataagaaaattgataac
cttcaagagctgttgccaattcttgaaaacgtcgctaaatcaggtcgtccattattgatcgttgctgaagatgttgaaggccaagcactagc
aacattggtagtaaacaacttgcgcggcacattcaaggttgcagcggttaaagcccctggttttggcgatcgtcgtaaagcgatgttgca
agatcttgccatcttgacgggtggtcaggttatttctgaagagctagggatgtctttagaaactgcggatccttcttctttgggtacggcaag
caaggttgttatcgataaagaaaacaccgtgattgttgatggcgcaggtactgaagcaagcgttaatactcgtgttgaccagatccgtgct
gaaatcgaaagctcgacttctgattacgacatcgaaaagttacaagaacgcgttgctaagcttgcgggcggcgttgccgtgattaaggtt

ggtgcgggttctgaaatggaaatgaaagagaagaaagaccgtgttgacgatgcacttcatgcaactcgcgcagcggttgaagaaggt

gttgttgcgggtggtggtgttgctttgattcgcgcactctcttcagtaaccgttgttggtgataacgaagatcaaaacgtcggtattgcattg

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cacaggtagctttggttttaacgccagcacaggtgagtatggcgatatgattgcgatgggtattttagaccctgcaaaagtcacgcgttca

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tatgcctgatatgggcggcatgggtggaatgggcggtatgcctggcatgatgtaatcactttgtgattcattgtcctgatctgcttaccgtG

TCGACATATTCAAGATAAAGATGCCTTCACTGACATCAGTCACCAACAATCAATC

AAACACCAATACCAATCGCAAAAACTCATAAAACTAGCCGATCACCAAATCCCA

AAAGCGTTCAAAAATGAAACGAGCACGTCACACAAAATCAATTTATACGCTAAC

GAACCAGGTCAAACTTATCGTTTTTTTGAGCACGTTTGTTCCACTAATGAAAGAG

AAAAGTCGTTAATTCACTGGCTTTTGGCGTATCCGCACCTTCACATAGAAATTAGT

AATGGCATGCTACTGGCCTTTAAAAAGAATCAGTTAATTGAAGAAACCTCGCTTA

TCTCAGCCATTACCGCTGTAGCCGAATTTGCGCTTATCCTCAGCCATGATTAAACT

GACGCCAATTAATATAAGACATACTAATTAATAACTCCCTTAATTGAGAAGAATA

ATGAAAAACACACTCAAATCCTCATCACGTTTTAGTCTGAAACAACTCGGCACCG

GCGCTCTGATTATCTCCAGTTTGTTCTTCGGTGGTTGCACCACAACACAACAAGAT

AATTTATACACAGGGGTTATGTCTCTTGCGAGAGACAGCGCTGGCCTAGAAGTTA

AAACAGCCTCTGCCGGTGACGTCAATCTTACTTATATGGAACGCCAAGGCAGTGA

CAAAGATAATGCCGAAAGCGTTATTTATTACACGGTTTCTCTGCTGATAAAGAT

AACTGGATTCTTTTTACCAAAGAATTCGATGAAAAATATCATGTTATCGCTGTCGA

TTTAGCGGGACATGGCGATTCAGAACAATTATTAACGACTGATTACGGTCTCATA

AAACAAGCCGAGCGTTTAGATATCTTCTTATCTGGCTTAGGGGTTAACTCATTTCA

CATCGCCGGTAATTCAATGGGGGGGGCTATCAGCGCAATCTACAGTTTGAGTCAC

CCAGAGAAAGTTAAAAGTCTTACATTGATCGATGCAGCAGGTGTCGATGGCGATA

CTGAAAGCGAATACTACAAAGTTTTGGCAGAAGGTAAGAATCCTTTAATTGCAAC

TGATGAAGCAAGTTTTGAATACCGCATGGGTTTCACCATGACTCAGCCTCCTTTCC

TACCTTGGCCACTAAGACCTTCTTTATTACGTAAAACGCTAGCCCGTGCCGAGATC

AATAACAAAATTTTTTCCGATATGCTGAAAACCAAAGAACGTTTAGGAATGACTA

ACTTTCAACAGAAAATTGAAGTGAAAATGGCTCAACATCCATTGCCAACACTGAT

TATGTGGGGCAAAGAAGATCGCGTTCTTGACGTATCCGCAGCAGCGGCCTTCAAA

AAAATAATTCCACAAGCAACTGTTCATATTTTTCCTGAAGTAGGCCACCTACCTAT

GGTAGAAATTCCTAGTGAAAGCGCTAAAGTTTATGAAGAGTTTTTGTCCTCTATTA

AATAAGAGCACATAATCATGACTGACTTATAAACAGCCAAGCATTTAAAATGCTT

GGCTGTTTATTTTAATGGCCAAATTATTCAACGACCAAGCTCTGCGGTAAAATCG

CAGTGGGTTTCTTGTTTTCATCAACAGCAACAAACGTGAAATACCCCGTAATCGC

ATTTTTCTGATTATCAAAATACATACTTTCCACCAGCATATTAACTTCAACTTTTA

AACTCGTCCGCCCTACCTCTATAACACTGGCAGTCAATTCGACAATGGTACCTGC

GGGAACAGGATGCTTAAAATCGATTCGATCACTGCTGACGGTTACGATGCTTTGT

CGAGAAAACGAGTCGCTGCAATAAAAGAAACCTCATCCATCCACTGCATTGCA

GTGCCACCGAATAACGTATCATGATGATTTGTTGTCTCTGGAAATACCGCTTTAGA

AATAGTGGTTTTTGATACGCGCTTTCGCTGCGCAATAATATCTTCTCTGCTAAGAG

TTGCGGATGGCATACATAAACTCGCTTGATTAAGATTAATAATAAATAGTTAACA

GTATATTGAACTGAGGGTCTGAAGAACTCTAATACCTCTGAAGAACTTTGAGGCC

GCTAGAGAGAAAAGACCAGTGATAATATTTCATCTTGCCATGAGAGCTTATCATG

AAAGCCTGTGCTTAAAATCAATCATTATATTTATTCATCTTTAATTGAAATAATAC

CAATATATTTCATATATAATTTCACACTACCCTTATCTCACTAGACTTCCCGCGCA

TAGGCGCAAACAATCAACGCAAGTTCACAATAAAGCGGTTCGCTGCAACACATG

CCCTAGCGTCTAAAGTAGCACGCACAACACTGGCCAGTCGTACTAGCCCCTTTGC

GATTCGTGCAGACGAGCAACAAGCGCTATTAAACTTACCTAAATTTCTAACCACC

ACCATTGGTTCTTTTCCACAAACTCAAAAAACTCGTCAAATCCGCTTGCAATTTAA

ACGCGATGACATAGATCTAATCGATTATCAAACCCGCATTCAAGCGCTCATTAAA

AACGCACCACTGGCAAGAAGTTCTACCTGCACTGACCAATATGCAAGCGGCGGC

GGAAGAGCTGCCTTTGATCGATCAAGAAGAAGGGAGCAGCAAAGAGGAAAACA

ATCAAAAGAGGAGAGCAATCAAATAAAAACGAGTTATTGAGGATTTTAATTTTA

AAACAGGTATATTAATACCCTCTCTCGTAGTAAACAATGACTGTATTTACACAAA

AATAAATAGAGGTATACCATGTCAAACATCTGGTTTGAAGTACCAAAGATTGAAG

TATTAAACCGTCAAATGGAAAATACTGCCTGCAGCAACTTAGGCATTCAAATTAC

AGAAATTGGCGATGATTATATCACTGGCACAATGCCAGCAGATGCACGTACCTTC

CAGCCAATGGGACTGATTCATGGCGGCTCAAATGTATTGCTGGCAGAAACACTGG

GCAGCATGGCAGCTAACTGCTGTATTAATTTGTCTCAAGAATATTGTGTTGGCCA

AGAAATTAACGCCAACCACATACGCGGTGTTCGTTCCGGCATAGTGACTGGCACA

GCAACGCTAGTACACAAAGGAAGAACCTCCCAGATTTGGGAAATTCGCATCGTTA

ACGATCCAAAGAATTCAAAAAGCTTCTCGAGAGTACTTCTAGAGCGGCCGCGGGCCCA

TCGATTTTCCACCCGGGTGGGGTACCAGGTAAGTGTACCCAATTCGCCCTATAGTGAGT

CGTATTACAATTCACTGGCCGTCGTTTTAC

Figure 7:

Amino acid sequences expressed from vector pBK1CpnSREst: - the co-expression of the stabilized single ring mutant chaperonin with the esterase gene (EstRB8) from *Oleispira antarctica* (cpn10::stabilized single ring mutant Glu460Ala/Ser462Ala/Val463Ala::est)

SEQ ID No 10: cpn10 (nucleotides 113 to 403: Frame 2 of Figure 8) 97 aa:

MKIRPLHDRIVVRRKEEETATAGGIILPGAAAEKPNQGVVISVGTGRILDNGSVQALA
VNEGDVVVFGKYSGQNTIDIDGEELLILNESDIYGVLEA

Below – ***Capital bold letters*** are the mutations introduced

SEQ ID No 11: stabilized single ring mutant of cpn60 (nucleotides 455 to 2098: Frame 2 of Figure 8) 548 aa:

MAAKDVLFGDSARAKMLVGVNILADAVRVTLGPKGRNVVIEKSFGAPIITKDGVSVA
REIELKDKFENMGAQMVKEVASQANDQAGDGTTTATVLAQAIISEGLKSVAAGMNP
MDLKRGIDKATAAVVAAIKEQAQPCLDTKAIAQVGTISANADETVGRLIAEAMEKVG
KEGVITVEEGKGLEDELDVVEGMQFDRGYLSPYFINNQEKMTVEMENPLILLVDKKI
DNLQELLPILENVAKSGRPLLIVAEDVEGQALATLVVNNLRGTFKVAAVKAPGFGDR
RKAMLQDLAILTGGQVISEELGMSLETADPSSLGTASKVVIDKENTVIVDGAGTEASV
NTRVDQIRAEIESSTSDYDIEKLQERVAKLAGGVAVIKVGAGSEMEMKEKKDRVDDA
LHATRAAVEEGVVAGGGVALIRALSSVTVVGDNEDQNVGIALALRAMEAPIRQIAGN
AGA*AG**AA*VVDKVKSGTGSFGFNASTGEYGDMIAMGILDPAKVTRSSLQAAASIAGL
MITTEAMVADAPVEEGAGGMPDMGGMGGMGGMPGMM

SEQ ID No 12: EstRB8 (nucleotides 2579 to 3577: Frame 2 of Figure 8) 333 aa:

MKNTLKSSSRFSLKQLGTGALIISSLFFGGCTTTQQDNLYTGVMSLARDSAGLEVKTA
SAGDVNLTYMERQGSDKDNAESVILLHGFSADKDNWILFTKEFDEKYHVIAVDLAG
HGDSEQLLTTDYGLIKQAERLDIFLSGLGVNSFHIAGNSMGGAISAIYSLSHPEKVKSL
TLIDAAGVDGDTESEYYKVLAEGKNPLIATDEASFEYRMGFTMTQPPFLPWPLRPSLL

RKTLARAEINNKIFSDMLKTKERLGMTNFQQKIEVKMAQHPLPTLIMWGKEDRVLD

VSAAAAFKKIIPQATVHIFPEVGHLPMVEIPSESAKVYEEFLSSIK

Figure 8:

SEQ ID No 13: DNA sequence of vector pBK1CpnSREst: the expression cassette for the co-expression of the stabilized single ring mutant chaperonin with the esterase gene (EstRB8) from *Oleispira antarctica* (cpn10::stabilized single ring mutant Glu460Ala/Ser462Ala/Val463Ala::est)

Nucleotide positions 1-75 correspond to reverse complement of positions 1196-1121 and positions 5233-5273 correspond to reverse complement of 1043-952 of pBK-CMV vector (Stratagene)

DNA fragment coding for Cpn10 and Cpn60 is flanked by *Sac*I site (pos. 69-75) and *Sal*I site (pos. 2138-2143).

In the DNA sequence:

Small letters – the Cpn10-Cpn60 coding fragment,

Capital italics – fragments of vector

Capital letters – fragment coding for EstRB8 from plasmid pBK1Est

Capital bold letters = introduced mutations

ACAGGAAACAGCTATGACCTTGATTACGCCAAGCTCGAAATTAACCCTCACTAAAGGGA

*ACAAAAGCTGGAGCTC*ctaatacttgggatccaacagttggagagtctagcaaatgaaaatccgtccattacatgatcgtatt

gttgttcgccgtaaagaagaagagaccgcaactgcgggtggtattattttaccgggcgctgcggcagaaaaaccaaatcaaggtgttgt

tatctctgtgggtactggccgtattcttgataatggttcagtgcaagcgctggcggttaacgaaggcgatgttgtcgtttttggtaaatactc

aggtcaaaatactatcgatatcgatggtgaagaattattgattttgaatgaaagtgatatctacggcgtttttagaagcttaattattacactca

ctttttatttaacctacaaaatttaaggaaagatcatggctgctaaagacgtattatttggtgatagcgcacgcgcaaaaatgttggtaggt

gtaaacattttagccgacgcagtaagagttaccttaggacctaaaggtcgtaacgttgttatagaaaaatcatttggtgcaccgatcatcac

caaagatggtgtttctgttgcgcgtgaaatcgaattgaaagacaaattcgaaaacatgggcgcacagatggttaaggaagttgcttctca

agccaacgaccaagccggtgacggcacaacgacagcgactgtactagcacaggcgattatcagcgaaggcttgaaatctgttgcgg

ctggcatgaatccaatggatcttaaacgtggtattgataaagctacggctgctgttgttgccgccattaaagaacaagctcagccttgcttg

gatacaaaagcaatcgctcaggtagggacaatctctgccaatgccgatgaaacggttggtcgtttaattgctgaagcgatggaaaaagt

cggtaaagaaggtgtgattaccgttgaagaaggcaaaggccttgaagacgagcttgatgttgtagaaggcatgcagttcgatcgcggtt

acttgtctccgtacttcatcaacaaccaagaaaaaatgaccgtagaaatggaaaatccattaattctattggttgataagaaaattgataac

cttcaagagctgttgccaattcttgaaaacgtcgctaaatcaggtcgtccattattgatcgttgctgaagatgttgaaggccaagcactagc

aacattggtagtaaacaacttgcgcggcacattcaaggttgcagcggttaaagcccctggttttggcgatcgtcgtaaagcgatgttgca

agatcttgccatcttgacgggtggtcaggttatttctgaagagctagggatgtctttagaaactgcggatccttcttctttgggtacggcaag

caaggttgttatcgataaagaaaacaccgtgattgttgatggcgcaggtactgaagcaagcgttaatactcgtgttgaccagatccgtgct

gaaatcgaaagctcgacttctgattacgacatcgaaaagttacaagaacgcgttgctaagcttgcgggcggcgttgccgtgattaaggtt

ggtgcgggttctgaaatggaaatgaaagagaagaaagaccgtgttgacgatgcacttcatgcaactcgcgcagcggttgaagaaggt

gttgttgcgggtggtggtgttgctttgattcgcgcactctcttcagtaaccgttgttggtgataacgaagatcaaaacgtcggtattgcattg

gcacttcgtgcgatggaagctcctatccgtcaaatcgcgggtaacgcaggtgctg**C**aggg**G**cag**C**ggttgttgataaagtgaaatct

ggcacaggtagctttggttttaacgccagcacaggtgagtatggcgatatgattgcgatgggtattttagaccctgcaaaagtcacgcgtt

catctctacaagccgcggcgtctatcgcaggtttgatgatcacaaccgaagccatggttgcggatgcgcctgttgaagaaggcgctggt

ggtatgcctgatatgggcggcatgggtggaatgggcggtatgcctggcatgatgtaatcactttgtgattcattgtcctgatctgcttaccg

tGTCGACATATTCAAGATAAAGATGCCTTCACTGACATCAGTCACCAACAATCAAT

CAAACACCAATACCAATCGCAAAAACTCATAAAACTAGCCGATCACCAAATCCC

AAAAGCGTTCAAAAATGAAACGAGCACGTCACACAAAATCAATTTATACGCTAA

CGAACCAGGTCAAACTTATCGTTTTTTTGAGCACGTTTGTTCCACTAATGAAAGAG

AAAAGTCGTTAATTCACTGGCTTTTGGCGTATCCGCACCTTCACATAGAAATTAGT

AATGGCATGCTACTGGCCTTTAAAAGAATCAGTTAATTGAAGAAACCTCGCTTA

TCTCAGCCATTACCGCTGTAGCCGAATTTGCGCTTATCCTCAGCCATGATTAAACT

GACGCCAATTAATATAAGACATACTAATTAATAACTCCCTTAATTGAGAAGAATA

ATGAAAAACACACTCAAATCCTCATCACGTTTTAGTCTGAAACAACTCGGCACCG

GCGCTCTGATTATCTCCAGTTTGTTCTTCGGTGGTTGCACCACAACACAACAAGAT

AATTTATACACAGGGGGTTATGTCTCTTGCGAGAGACAGCGCTGGCCTAGAAGTTA

AAACAGCCTCTGCCGGTGACGTCAATCTTACTTATATGGAACGCCAAGGCAGTGA

CAAAGATAATGCCGAAAGCGTTATTTTATTACACGGTTTCTCTGCTGATAAAGAT

AACTGGATTCTTTTTACCAAAGAATTCGATGAAAAATATCATGTTATCGCTGTCGA

TTTAGCGGGACATGGCGATTCAGAACAATTATTAACGACTGATTACGGTCTCATA

AAACAAGCCGAGCGTTTAGATATCTTCTTATCTGGCTTAGGGGTTAACTCATTTCA

CATCGCCGGTAATTCAATGGGGGGGGGCTATCAGCGCAATCTACAGTTTGAGTCAC

CCAGAGAAAGTTAAAAGTCTTACATTGATCGATGCAGCAGGTGTCGATGGCGATA

CTGAAAGCGAATACTACAAAGTTTTGGCAGAAGGTAAGAATCCTTTAATTGCAAC

TGATGAAGCAAGTTTTGAATACCGCATGGGTTTCACCATGACTCAGCCTCCTTTCC

TACCTTGGCCACTAAGACCTTCTTTATTACGTAAAACGCTAGCCCGTGCCGAGATC
AATAACAAAATTTTTTCCGATATGCTGAAAACCAAAGAACGTTTAGGAATGACTA
ACTTTCAACAGAAAATTGAAGTGAAAATGGCTCAACATCCATTGCCAACACTGAT
TATGTGGGGCAAAGAAGATCGCGTTCTTGACGTATCCGCAGCAGCGGCCTTCAAA
AAAATAATTCCACAAGCAACTGTTCATATTTTTCCTGAAGTAGGCCACCTACCTAT
GGTAGAAATTCCTAGTGAAAGCGCTAAAGTTTATGAAGAGTTTTTGTCCTCTATTA
AATAAGAGCACATAATCATGACTGACTTATAAACAGCCAAGCATTTAAAATGCTT
GGCTGTTTATTTTAATGGCCAAATTATTCAACGACCAAGCTCTGCGGTAAAATCG
CAGTGGGTTTCTTGTTTTCATCAACAGCAACAAACGTGAAATACCCCGTAATCGC
ATTTTTCTGATTATCAAAATACATACTTTCCACCAGCATATTAACTTCAACTTTTA
AACTCGTCCGCCCTACCTCTATAACACTGGCAGTCAATTCGACAATGGTACCTGC
GGGAACAGGATGCTTAAAATCGATTCGATCACTGCTGACGGTTACGATGCTTTGT
CGAGAAAAACGAGTCGCTGCAATAAAAGAAACCTCATCCATCCACTGCATTGCA
GTGCCACCGAATAACGTATCATGATGATTTGTTGTCTCTGGAAATACCGCTTTAGA
AATAGTGGTTTTTGATACGCGCTTTCGCTGCGCAATAATATCTTCTCTGCTAAGAG
TTGCGGATGGCATACATAAACTCGCTTGATTAAGATTAATAATAAATAGTTAACA
GTATATTGAACTGAGGGTCTGAAGAACTCTAATACCTCTGAAGAACTTTGAGGCC
GCTAGAGAGAAAAGACCAGTGATAATATTTCATCTTGCCATGAGAGCTTATCATG
AAAGCCTGTGCTTAAAATCAATCATTATATTTATTCATCTTTAATTGAAATAATAC
CAATATATTTCATATATAATTTCACTACCCTTATCTCACTAGACTTCCCGCGCA
TAGGCGCAAACAATCAACGCAAGTTCACAATAAAGCGGTTCGCTGCAACACATG
CCCTAGCGTCTAAAGTAGCACGCACAACACTGGCCAGTCGTACTAGCCCCTTTGC
GATTCGTGCAGACGAGCAACAAGCGCTATTAAACTTACCTAAATTTCTAACCACC
ACCATTGGTTCTTTTCCACAAACTCAAAAAACTCGTCAAATCCGCTTGCAATTTAA
ACGCGATGACATAGATCTAATCGATTATCAAACCCGCATTCAAGCGCTCATTAAA
AACGCACCACTGGCAAGAAGTTCTACCTGCACTGACCAATATGCAAGCGGCGGC
GGAAGAGCTGCCTTTGATCGATCAAGAAGAAGGGAGCAGCAAAGAGGAAAACA
ATCAAAAGAGGAGAGCAATCAAATAAAAACGAGTTATTGAGGATTTTAATTTTA
AAACAGGTATATTAATACCCTCTCGTAGTAAACAATGACTGTATTTACACAAA
AATAAATAGAGGTATACCATGTCAAACATCTGGTTTGAAGTACCAAAGATTGAAG
TATTAAACCGTCAAATGGAAAATACTGCCTGCAGCAACTTAGGCATTCAAATTAC
AGAAATTGGCGATGATTATATCACTGGCACAATGCCAGCAGATGCACGTACCTTC
CAGCCAATGGGACTGATTCATGGCGGCTCAAATGTATTGCTGGCAGAAACACTGG
GCAGCATGGCAGCTAACTGCTGTATTAATTTGTCTCAAGAATATTGTGTTGGCCA

AGAAATTAACGCCAACCACATACGCGGTGTTCGTTCCGGCATAGTGACTGGCACA
GCAACGCTAGTACACAAAGGAAGAACCTCCCAGATTTGGGAAATTCGCATCGTTA
ACGATCCAAAGAATTCAAAAAGCTTCTCGAGAGTACTTCTAGAGCGGCCGCGGGCCCA
TCGATTTTCCACCCGGGTGGGGTACCAGGTAAGTGTACCCAATTCGCCCTATAGTGAGT
CGTATTACAATTCACTGGCCGTCGTTTTAC

Figure 9:

Amino acid sequence of the stabilized single ring mutant Glu460Ala/Ser462Ala/Val463Ala of
Cpn60:

SEQ ID No 14: Cpn10 (nucleotides 458-751of Figure 10):

MKIRPLHDRIVVRRKEEETATAGGIILPGAAAEKPNQGVVISVGTGRILDNGSVQALA
VNEGDVVVFGKYSGQNTIDIDGEELLILNESDIYGVLEA

SEQ ID No 15: Cpn60 (nucleotides 458-751 of Figure 10):

MAAKDVLFGDSARAKMLVGVNILADAVRVTLGPKGRNVVIEKSFGAPIITKDGVSVA
REIELKDKFENMGAQMVKEVASQANDQAGDGTTTATVLAQAIISEGLKSVAAGMNP
MDLKRGIDKATAAVVAAIKEQAQPCLDTKAIAQVGTISANADETVGRLIAEAMEKVG
KEGVITVEEGKGLEDELDVVEGMQFDRGYLSPYFINNQEKMTVEMENPLILLVDKKI
DNLQELLPILENVAKSGRPLLIVAEDVEGQALATLVVNNLRGTFKVAAVKAPGFGDR
RKAMLQDLAILTGGQVISEELGMSLETADPSSLGTASKVVIDKENTVIVDGAGTEASV
NTRVDQIRAEIESSTSDYDIEKLQERVAKLAGGVAVIKVGAGSEMEMKEKKDRVDDA
LHATRAAVEEGVVAGGGVALIRALSSVTVVGDNEDQNVGIALALRAMEAPIRQIAGN
AGAAGAAVVDKVKSGTGSFGFNASTGEYGDMIAMGILDPAKVTRSSLQAAASIAGL
MITTEAMVADAPVEEGAGGMPDMGGMGGMGGMPGMM

Figure 10:

SEQ ID No 16: DNA sequence of the stabilized single ring mutant Glu460Ala/Ser462Ala/Val463Ala:

In the DNA sequence:

Small letters – the Cpn10-Cpn60 coding fragment,

Big bold letters = introduced mutations

atcaaaaaatgcagcaaggacagattcctgcccaagaattagcagaaggtttcttgttagcactggccggcgctttattattaacgccgg

gttttgtcactgatgcgctgggttttacattactcgtccccgcgacgcgtaaagcgttggtccataaggtgattgcatttattacccctc

gcatgatgactgcaagcagctttcaagcgacgggtagttttcaggaaggctcgtttaaagatgtacattcgcacactgactcgcaaagca

gtcatgaaaaaatcacaattgaaggcgaatataccaaagacgataagtaggtattttttcggctagccgttgaaatcctagtaaaagccc

cgataaattaaccatctattttttcacagaggcaatttagcctttgtttaccttattgatcctaatacttgggatccaacagttggagagtctagc

aaatgaaaatccgtccattacatgatcgtattgttgttcgccgtaaagaagaagagaccgcaactgcgggtggtattattttacc

gggcgctgcggcagaaaaaccaaatcaaggtgttgttatctctgtgggtactggccgtattcttgataatggttcagtgcaagcgctggc

ggttaacgaaggcgatgttgtcgtttttggtaaatactcaggtcaaaatactatcgatatcgatggtgaagaattattgattttgaatga

aagtgatatctacggcgttttagaagcttaattattacactcactttttttatttaacctacaaaatttaaggaaagatcatggctgctaaagacg

tattatttggtgatagcgcacgcgcaaaaatgttggtaggtgtaaacattttagccgacgcagtaagagttaccttaggacctaa

aggtcgtaacgttgttatagaaaaatcatttggtgcaccgatcatcaccaaagatggtgtttctgttgcgcgtgaaatcgaattgaaagaca

aattcgaaaacatgggcgcacagatggttaaggaagttgcttctcaagccaacgaccaagccggtgacggcacaacgacagcgactg

tactagcacaggcgattatcagcgaaggcttgaaatctgttgcggctggcatgaatccaatggatcttaaacgtggtattgataaagctac

ggctgctgttgttgccgccattaaagaacaagctcagccttgcttggatacaaaagcaatcgctcaggtagggacaatctctgccaatgc

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tggcgcaggtactgaagcaagcgttaatactcgtgttgaccagatccgtgctgaaatcgaaagctcgacttctgattacgacatcgaaaa

gttacaagaacgcgttgctaagcttgcgggcggcgttgccgtgattaaggttggtgcgggttctgaaatggaaatgaaagagaagaaa

gaccgtgttgacgatgcacttcatgcaactcgcgcagcggttgaagaaggtgttgttgcgggtggtggtgttgctttgattcgcgcactct

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agtatggcgatatgattgcgatgggtattttagaccctgcaaaagtcacgcgttcatctctacaagccgcggcgtctatcgcaggtttgat

gatcacaaccgaagccatggttgcggatgcgcctgttgaagaaggcgctggtggtatgcctgatatgggcggcatgggtggaatggg

cggtatgcctggcatgatgtaatcactttgtgattcattgtcctgatctgcttaccgtgtaaaaagatcaggctcaaggctgtctctataaaa

agccgtatctttgatgagtgttgtctttctgctgaaaacgacattcttggagtgcggctttttttgattttggtcataaaattcagaatattgtgta

attttatgtaactagctggcctataatgttgagttcctctgggtggcatgatctcatggtacttcacttaagcctgattcactgcg

gctttaacagtaaaataataacgcaacgtagaaacataataagcgtatggcattaatgaagacggctgcatttaattcagatc